Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

seeded. Its synonymous names are characteristic: *R. stamineum* Smith, for the remarkably long stamens; *R. fuchsioides* Berlandier, for the resemblance to a fuchsia-blossom. In England, where it is hardy, it is prized in cultivation for its brilliant red flowers garnished by the shining and almost evergreen leaves. Trained to the wall of a house, it may be carried to the height of fifteen or twenty feet.

A synoptical view of the species will be convenient: —

Flowers several in a raceme, small and flattish, greenish	R. LACUSTRE.
Flowers 1 to 4 on the peduncle (calyx-tube at least as high as broad):	
Yellow or yellowish, tubular	R. LEPTANTHUM.
White, tubular, with short lobes	R. SETOSUM.
Greenish, with lobes shorter than the bell-shaped tube	R. CYNOSBATI.
White or whitish, narrow, with lobes longer than the tube and shorter than the half-inch stamens	R. GRACILE.
Greenish or dull purplish lobes; longer than the tube:	
Nearly equaling the stamens	R. OXYACANTHOIDES.
At length shorter than the stamens:	
Calyx-tube and lobes rather narrow	R ROTUNDIFOLIUM.
Calyx-tube and petals broad	R. DIVARICATUM.
Purplish-red, larger; Pacific species:	
Anthers oval, pointless	R. LOBBII.
Anthers sagittate, mucronate	R. MENZIESII.
Scarlet-red, very long-stamened, Californian	R. SPECIOSUM.

◆

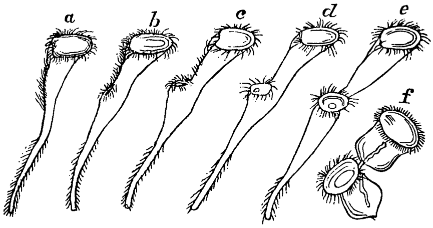
MULTIPLICATION BY FISSION IN STENTOR MÜLLERI

BY HON. J. D. COX.

I HAD the good fortune, one evening lately, to observe the whole process of the division of a large *Stentor Mülleri* into two complete individuals, by fission. The circumstances were favorable for pretty carefully noting the phenomena exhibited as the change went on, and there were some of them which I have not seen narrated, and which have a direct bearing upon the question of the organization of this group of infusoria.

The water was from the Maumee River at Toledo, Ohio, on Lake Erie, and contained a good variety of infusoria and of rotifers, which had propagated quite rapidly in the glass jar, among some aquatic plants carelessly thrown into it. The specimen of Stentor under consideration attracted my attention by its size, as it was about four hundredths (.04) of an inch in length, the stalk being stretched till it appeared about one half longer than the proportions shown in the engraving of *Stentor Mülleri* in the Micrographic Dictionary.

Whilst examining other forms in the compressor, I returned to this from time to time to enjoy its beauties, and soon noticed that the ciliary motion was extending from the disk, at the point of depression in its horseshoe shape, down along the body about one quarter of its whole length, and this gradually became more marked until the Stentor presented the appearance shown in outline in Figure 16 *a*. The portion of the body immediately under the disk swelled slightly, and the general form somewhat resembled the flower of the calla lily.



(FIG. 16.) PROCESS OF FISSION IN STENTOR MÜLLERI.

The next change noticed was that at the bottom of the slit in the side the opening took a rounded form, so that the chain-like motion of the cilia looked (as a member of my family expressed it) as if a chain were running over a little pulley, and the cilia made a continuous fringe around the disk, down the body, and around the circular end of the slit, as shown in Figure 16 *b*.

The body now began to show a protuberant swelling immediately under the small circular opening at the lower end of the ciliated slit, and in a few minutes this enlargement equaled in diameter the previous thickness of the body of the Stentor at this point, thus doubling its size at the point of greatest expansion. The protuberance was distinctly on one side of the body, and appeared as an excrescence, the ciliated line running out to its apex, and the Stentor now showing the appearance outlined in Figure 16 *c*.

The swelling continued to increase, involving gradually the whole circumference of the body of the animalcule, the upper side of the protuberance assumed a sharper angle to the longitudinal line of the body, becoming more disk-like, while the line of the cilia enlarged so as to show an approach to the general form of the original head of the Stentor, the new oral opening gradually enlarging and deepening. Figure 16 *d* shows the appearance about a quarter of an hour later than that represented by Figure 16 *c*.

The slit line between the two disks now disappeared, and at the end of another quarter of an hour the upper portion of the body was attached to the lower by a connection no thicker than the tail of the original had been, though in each the disk was about one third smaller than the original disk, and the slope from it to the smaller part of the body below was much less abrupt than in the usual stretched form of the animal when its disk is expanded. Figure 16 *e* represents its appearance at this time. The oral opening of the lower disk was now plainly seen to connect with the general internal canal by a circular orifice which varied in size, sometimes disappearing as if closed by a sphincter.

Up to this period of development the Stentor had kept its place, attached by its tail to the upper glass of the Wenham compressor, its body stretched at great length, its cilia in rapid and vigorous motion, the whole animal waving slowly or partially rotating on its longitudinal axis. Now, however, it quickly retracted with a spring like the recoil of a bit of stretched India-rubber, in the manner common to it and the smaller Vorticellæ which have long pedicels. The two parts of the body, or more properly the twin bodies, enlarged in diameter while shortening in length, and it was apparent that the mass of each was about equal to the other, although the lower part had been more than twice as long as the upper when the whole had been stretched at full length. The form of the parts was now almost exactly alike in each, and resembled the common bell-shaped Vorticellæ, such as *Vorticella campanula*, etc. In the retraction the internal canal, which now became plainly visible, also enlarged in diameter when relieved from the stretch, and appeared slightly convoluted. It passed out from the lower body just below the margin of the disk, and entered the upper body at its caudal extremity, apparently having only an extremely thin membranous wall at the point of junction of the two bodies. These bodies now began a sort of swaying and gyratory motion, the lower one still fast to the glass by its tail, and the upper one swinging slowly around, the umbilicus between the two becoming smaller and smaller as if twisted up. Figure 16 *f* is a sketch of the appearance at this time.

Suddenly the connection parted, and the two Stentors swam separately away, both assuming the common form of the animalcule when free-swimming, and differing from the original individual only in being of smaller size.

The complete transformation through all the stages I have noted occupied about two hours. I did not observe any internal difference of structure at the point where the swelling first began. No distinctly marked internal canal or sack could be seen when the body was stretched to its full length, but the manner in which it became unmistakably visible on the sudden retraction before the final separation of the parts looked strongly as if it had been there, but was drawn out to such tenuity as to be no longer apparent through the semi-translucent body.

Again, there was no doubt in regard to the fact that the ciliated line or slit extending from the disk down the body of the animalcule became apparent only after it had been some time under observation, and that the length and activity of the cilia along it increased rapidly within a very few minutes, so as to become a striking and marked feature of its appearance. This raises the question whether the fringe of cilia down the body, as described, is a specific characteristic of the *Stentor Mülleri*, or is not rather a mark of the beginning of fission in all Stentors, — a question which an amateur naturalist may state, but will not presume to express an opinion upon.

In the instance above reported it is noteworthy that, except in the first appearance of the ciliated line down the body, there was nothing resembling a division by cutting or splitting. The body was of larger diameter than before, both above and below the new disk, when it first assumed the form of a protuberance with a ciliated circle on its anterior side; and the subsequent diminution of the diameter of the body and tail of the upper individual was gradual throughout its length, through the stages shown by the drawings.

The observations were made with a quarter-inch objective of low angle, but excellent definition and penetration, with the B eyepiece, and the situation of the Stentor in the compressor was very favorable for an unobstructed view of the phenomena at all stages.

PRIMITIVE MAN.[1]

THE steady progress of discovery justifies the inference that man, in the earliest periods of his existence of which we have any knowledge, was at the best a savage, enjoying the advantage of a few rude inventions. According to the theory of evolution, which has the merit of being based on and not being inconsistent with observed analogies and processes of nature, he must have gone through a period when he was passing out of the animal into the human state, when he was not yet provided with tools of any sort, and when he lived simply the life of a brute.

No proofs, however, of man in this earliest stage have as yet been found, and the term "primitive man," if intended to be strictly applied, is at present a misnomer. The earliest traces thus far discovered do not reveal to us his beginning. This is still hidden in that mysterious past out of which he has emerged and into which neither science nor exploration has as yet pene-

[1] From the late Professor Wyman's Shell-Mounds of Florida.